

**An Interdisciplinary Study of St. Georges Bay Fish Harvesters'  
Ecological Knowledge: White Hake (*Urophycis tenuis*)  
Predation on Juvenile American Lobster (*Homarus  
americanus*). Phase II**

**A Preliminary Report of Research Results**

SRSF Research Report #5

**Prepared by**

Hadley J. Watts  
Social Research for Sustainable Fisheries Research Assistant

and

Holli C. MacPherson  
Project Officer, Social Research for Sustainable Fisheries

In Collaboration with

*Fisheries and Oceans Canada, Gulf Region  
Gulf Nova Scotia Bonafide Fishermen's Association*

2002

**White Hake (*Urophycis tenuis*) Predation on Juvenile American Lobster  
(*Homarus americanus*) in St. Georges Bay, Nova Scotia**

*Hadley J. Watts*

Social Research for Sustainable Fisheries Research Assistant  
and

*Holli C. MacPherson*

Project Officer, Social Research for Sustainable Fisheries  
with  
Gulf Nova Scotia Bonafide Fishermen's Association

Saint Francis Xavier University, Antigonish, Nova Scotia

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## Summary of Findings<sup>1</sup>

White hake (*Urophycis tenuis*) is a demersal fish species that inhabits the nearshore waters of the Southern Gulf of St. Lawrence (sGSL). Feeding information is all but absent for this population. Recently, many St. Georges Bay fishermen have expressed concern that the white hake is a predator of juvenile American lobster (*Homarus americanus*). Standard research surveys do not support these concerns. Fishermen maintain, however, that the research surveys were conducted at inappropriate sampling times and locations to detect this predation. The present study is one component of a multiphase collaboration. It sampled demersal fishes in St. Georges Bay in July 2002 during a time and in locations selected fishermen, identified by their peers as particularly knowledgeable about the local fishing grounds, recommended as appropriate for sampling white hake preying upon lobster. Fourteen gillnet sets were made at each of three sampling areas. A total of 268 groundfish stomachs were collected, including 159 of white hake.

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<sup>1</sup> This study could not have been initiated, conducted and completed without the assistance of Dr. Anthony Davis (St. FXU), Dr. Mark Hanson (DFO Moncton), Dr. John Wagner (St. FXU), Dr. Michael Chadwick (DFO Moncton), and Ms. Kay Wallace (Gulf Nova Scotia Bonafide Fishermen's Association). We are especially grateful to Gulf Nova Scotia Bonafide Fishermen's Association Member Mr. John Gavin, for the use of his boat and assistance, and Mr. Jason MacLeod for his help in catching and sampling the fish. Thank you also to North Bay Fishermen's Co-op for allowing us to store the sampled stomachs in their freezer.

The research was supported by a Fisheries and Oceans Science and Technology Horizons Internship and a research grant won from the Department of Fisheries and Oceans Science Subvention Program. Other partners made critical in-kind contributions such as boat time and equipment from the Gulf Nova Scotia Bonafide Fishermen's Association and its members, and in-kind contributions such as faculty time, office and laboratory space, computer time, and business office-based grant management services from St. Francis Xavier University.

## Introduction

White hake (*Urophycis tenuis*) is a bottom dwelling fish species that occurs as two distinct subpopulations in the southern Gulf of St. Lawrence (sGSL). One population lives in the deep, warm, waters of the Laurentian Channel while the second is confined to the coastal waters (i.e., <40 m deep) of the southern Gulf (Hurlbut & Clay 1998). In coastal waters, white hake appear to be the top predator. Today, white hake is limited to the eastern end of the Northumberland Strait. The fishery is closed due to low numbers of this fish. The only known remaining spawning area is in St. Georges Bay (Poirier et al. 2000; Hurlbut & Poirier 2001). As with many of the marine fishes in Canada's Atlantic waters, the basic feeding information of white hake is all but lacking for the sGSL population(s) (reviewed by Hanson & Lanteigne 2000).

Recently, many St. Georges Bay fishermen have been concerned with groundfish predation, particularly that of white hake, on the juvenile American lobster (*Homarus americanus*). The concern is that as depleted groundfish populations recover from the effects of overfishing, they will consume an increasing number of juvenile lobsters and decrease the recruitment of juveniles into the harvestable size-classes. Consequently, the Department of Fisheries and Oceans (DFO) conducted seasonal surveys to assess these concerns. The results of these studies did not support the concerns of St. Georges Bay fishermen. The fishermen have since argued that these studies were conducted in the wrong places at inappropriate times of the year.

To address these concerns, a research collaboration was formed between Interdisciplinary Studies in Aquatic Resources (ISAR), Social Research for Sustainable

Fisheries (SRSF) at St. Francis Xavier University, Fisheries and Oceans Canada (Gulf Region, Moncton, NB), and the Gulf Nova Scotia Bonafide Fishermen's Association (GNSBFA). Within this research collaboration, St. Georges Bay fish harvesters have been interviewed within a systematic framework for the purpose of determining the area and time of year in which the study of white hake predation on juvenile lobsters is to be conducted.

Phase 1 of this study showed that white hake were not an important predator of American lobster during early autumn in waters 30 to 40 meters deep. Indeed, the study found that white hake did not eat any American lobster, and that herring was the principal prey. The other important prey of white hake were mackerel, squid, flatfish, shrimp (two species), rock crab, white hake, and cod. After further consultation, the second phase of this study was conducted at a different time of year and in different locations. Specifically, the fishermen concluded that lobster would be a prominent prey of white hake collected in waters 15 to 30 meters deep during July and that large numbers of fish would be found in this depth zone. The purpose of this study was to examine these two expectations.

## **Methods and Materials**

### *Sample site selection*

A sample of St. Georges Bay fishermen were interviewed and asked where and when white hake should be sampled in order to examine white hake predation on juvenile lobster. The fishermen interviewed had been identified by a stratified random sample of their peers as especially knowledgeable about the local fishing ground. Consequently, three sampling areas in St. Georges Bay, Nova Scotia were identified (Figure 1) as

locations where large numbers of white hake would be found and that juvenile lobster would be an important prey of these fish. In addition, the consensus was that this sampling should occur during July.

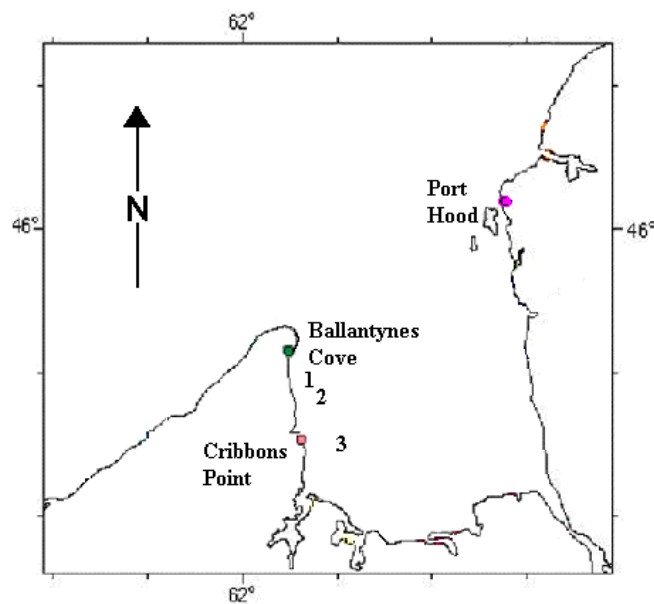


Figure 1. Map of St. Georges Bay, Nova Scotia. Figure shows the three sites where groundfish sampling occurred in July 2002. (1= Site 1, 2= Site 2, 3= Site 3).

### *Sampling procedure*

Each of the three areas was sampled with 1 string of gillnets. Each string was composed of 4 panels, 100 fathoms in length. These strings had alternating net mesh sizes of 5 ½ and 6 inches. The purpose of this procedure was to sample select for adult fish, particularly white hake. Sampling commenced on July 14<sup>th</sup> 2002 and ended July 30<sup>th</sup> 2002.

### *Stomach sampling*

All fish were taken out of the nets on board the vessel and their stomachs were removed and placed in individual plastic bags. Individual stomachs were labelled with site number, date, species, length of fish, and whether the fish was in reproductive condition. The site number would be used later as a reference to which of the three sites the fish was sampled from. The plastic bags were immediately placed on ice and stored in insulated boxes. Upon return to the wharf, the stomachs were placed in a freezer until further analysis.

### *Stomach analysis*

Two research assistants were trained in stomach contents description and analysis in the Moncton, N.B., Fisheries and Oceans science laboratory by Dr. Mark Hanson. Stomachs were thawed in cold water in the laboratory. Each stomach was cut open and prey were identified to species level (if possible), blotted wet weight recorded, and, when possible, length was measured.

## **Results and Discussion**

### *White Hake Size Distribution*

A total of 159 white hake were gathered. Similar numbers of white hake as well as lengths were sampled from each of the three sampling sites (Table 1).

**Table 1.** Number and average lengths of white hake sampled in early fall of 2002 in St. Georges Bay, Nova Scotia.

Site No.	White Hake No.	Avg. Length (cm)
1	47	63.1
2	75	59.9
3	47	62

The size distribution (Figure 2) shows the sampling method was very selective for adult white hake. Only 7 white hake under the length of 45 centimetres were captured.

#### *Stomach analysis*

Herring and mackerel were the most important prey of white hake (Figure 3). Other prey found included shrimp (*Pandulus montagui*, *Crangon septumspinosa*), snakeblenny, flatfish, roundfish, rock crab, 4 beard-rockling, and sculpin. No American lobsters were found in the stomachs of white hake.

#### *Reproductive State*

The presence of significant numbers of white hake with mature eggs was noted in sets 13 through 42. Here, 41 of the 82 fish collected were in spawning condition. This may indicate that the white hake being sampled were from a spawning population and were not feeding. This may explain why 61 % of white hake stomachs were empty.

#### *Other sampled fish*

A total of 109 “other” groundfish were collected, including: sea raven (*Hemitripterus americanus*), shorthorn sculpin (*Myoxocephalus scorpius*), spiny dogfish (*Squalus acanthias*), Atlantic cod (*Gadus morhua*), longhorn sculpin (*Myoxocephalus octodecemspinus*), and ocean pout (*Macrozoarces americanus*) (Table 2, Figures 4 – 7).

**Table 2.** Other groundfish species sampled during July 2002 in St. Georges Bay, Nova Scotia.

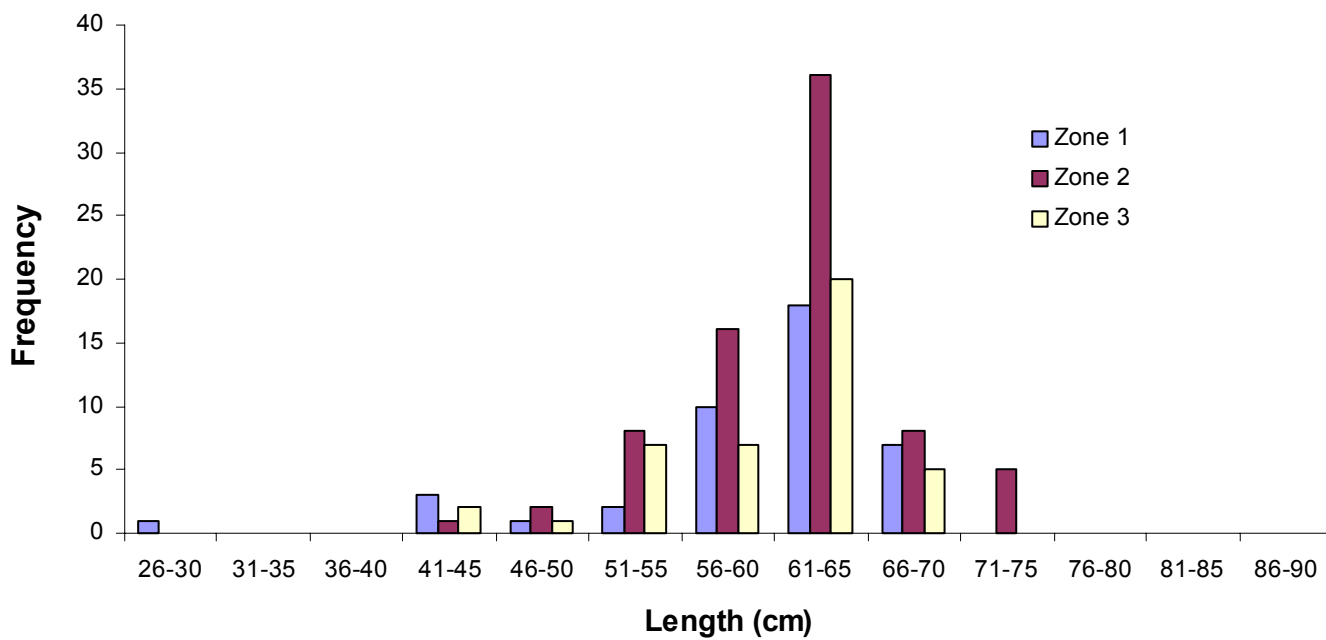


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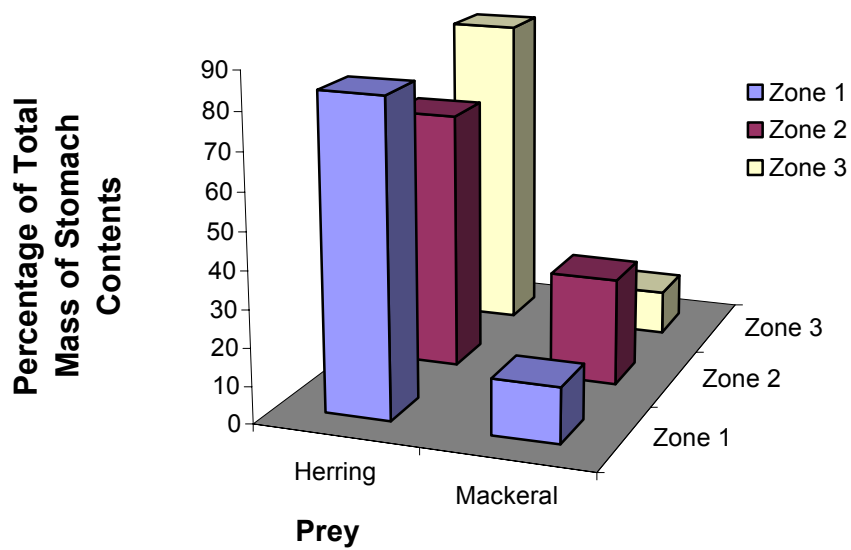
Species	Number Sampled
Atlantic cod	9
Shorthorn sculpin	24
Sea raven	63
Dogfish	10
Ocean pout	1
Longhorn sculpin	2

Of these 6 species, only shorthorn sculpin stomachs contained American lobster. A total of nine American lobsters were found in the stomachs of shorthorn sculpin. While the sample size is small, this high occurrence of American lobster in the stomachs is consistent with previous studies that report shorthorn sculpin are an important predator of American lobster (Hanson and Lanteigne 2000). Future work on the predatory habits of this species is needed in order to assess the extent to which it interacts with American lobster.

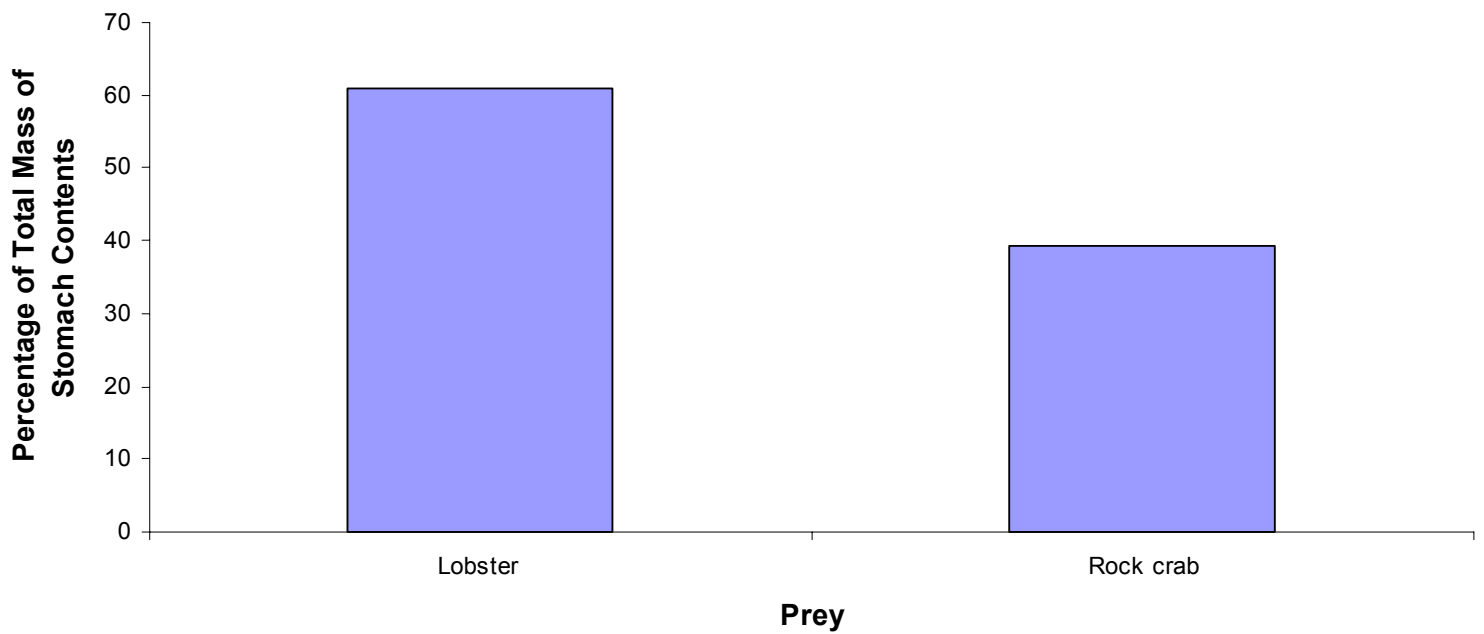
In summary, the expectations that large numbers of white hake would be captured in waters 15 to 30 meters deep in St. Georges Bay during July, and that substantial numbers of American lobster would be eaten by white hake are not supported by the results of this research. The third phase of this study, to be conducted in September 2002, will repeat the sampling conducted during September 2001 and July 2002, except that additional specimens will be collected concurrently by a research trawler over a wide area of the eastern end of Northumberland Strait (including St. George's Bay).



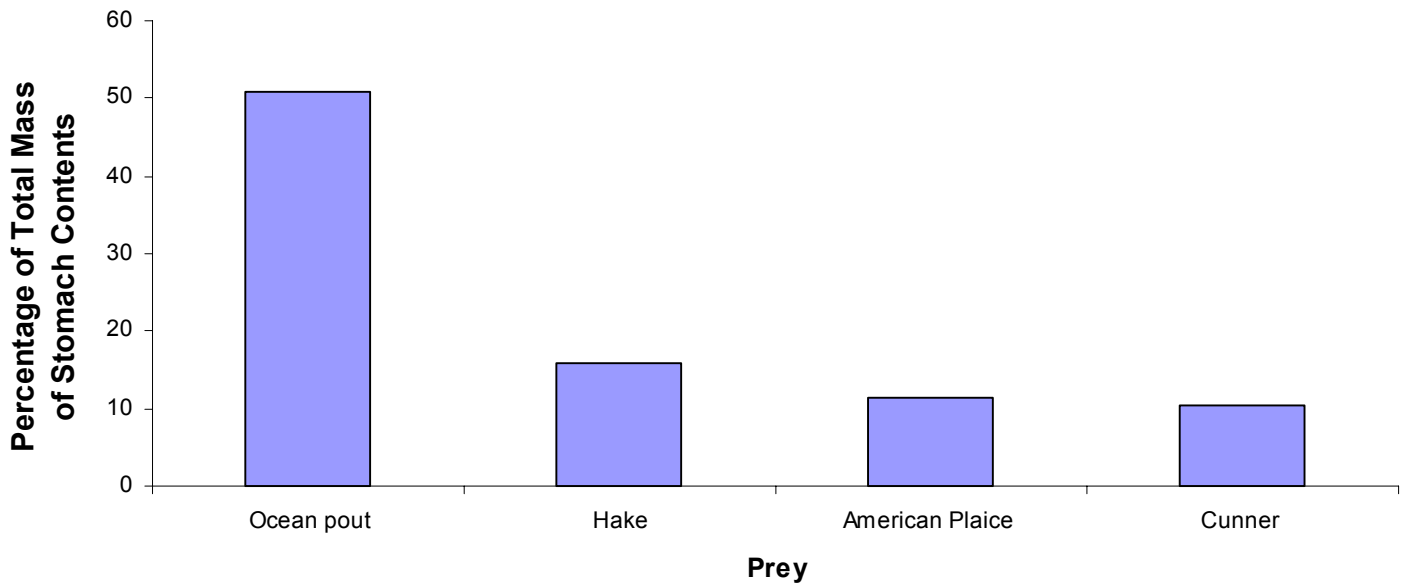
**Figure 2. White hake (*Urophycis tenuis*) Distribution Plot. Hake were caught in July 2002 in St. Georges Bay, Nova Scotia.**



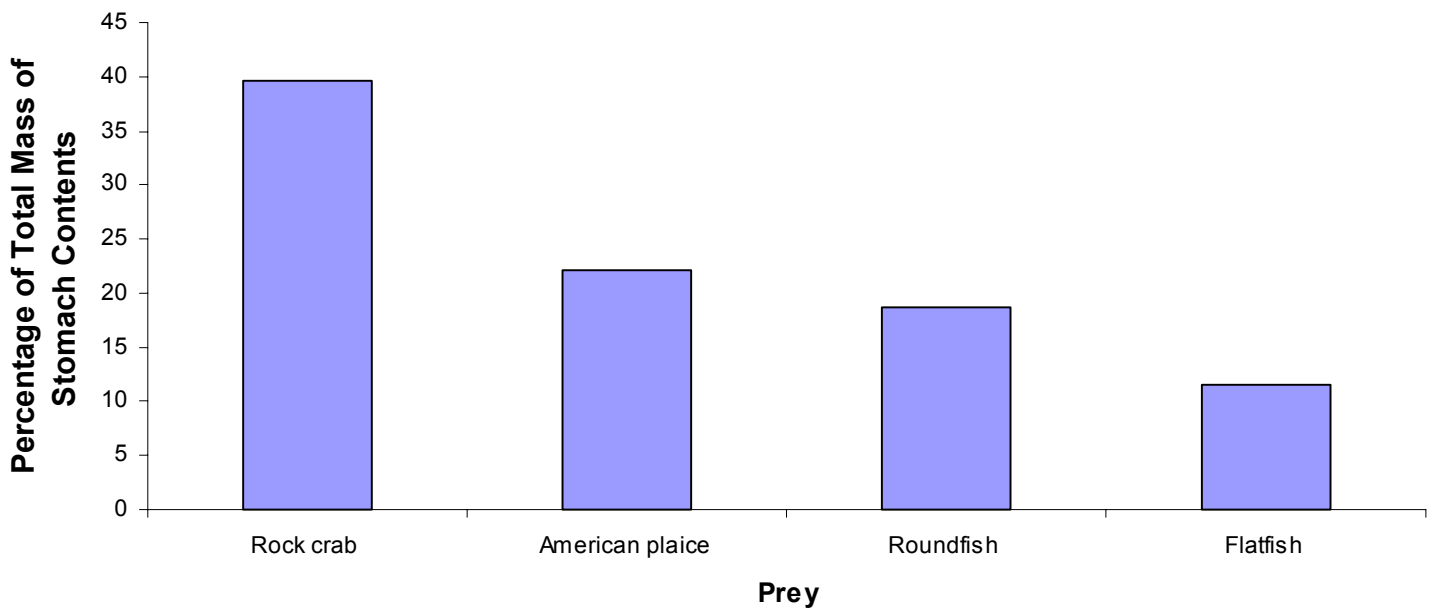
**Figure 3. Percentage of Prey Consumed by White hake (*Urophycis tenius*). Hake were caught in July 2002 in St. Georges Bay, Nova Scotia.**



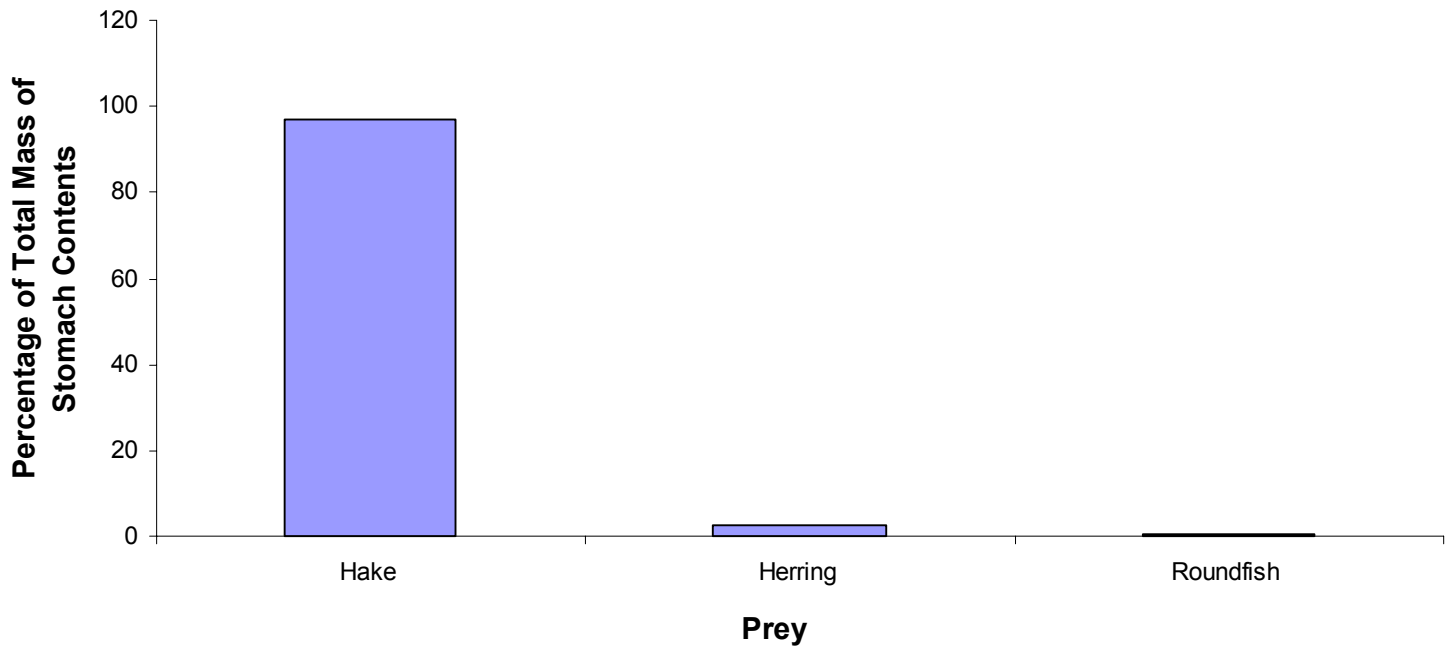
**Figure 4. Percentage of Prey Consumed by Shorthorn Sculpin (*Myoxocephalus scorpius*). Sculpin were caught in July 2002 in St. Georges Bay, Nova Scotia.**



**Figure 5. Percentage of Prey Consumed by Sea Raven (*Hemitripteris americanus*). Sea Raven were caught in July 2002 in St. Georges Bay, Nova Scotia.**



**Figure 6. Percentage of Prey Consumed by Atlantic Cod (*Gadus morhua*).  
Cod were caught in July 2002 in St. Georges Bay, Nova Scotia.**



**Figure 7. Percentage of Prey Consumed by Spiny Dogfish (*Squalus acanthias*). Dogfish were caught in July 2002 in St. Georges Bay, Nova Scotia.**

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